[original patent document: page (1)]

(19)Japanese Patent Office (JP)

(12) Publication of Unexamined Patent Application (A)

(11) *Kokai* Number:
Kokai No. S64-39728

(43) Date of Publication: February 10, 1989

(51)Int. Cl.[4]	Identification Symbol	JPO File Number
H 01 L 21/302		C-8223-5F
21/31		C-6708-5F

Request for Examination: Not Requested

Number of Claims: 1

(Total of 3 Pages)

---

(54) Title of the Invention:

APPARATUS FOR PRODUCING SEMICONDUCTOR UTILIZING PLASMA REACTION

(21) Application Number: Application No. S62-196833

(22) Filing Date: August 5, 1987

(72) Inventor: Hidesuke Tanaka
Mitsubishi Electric Corporation
Itami Seisakusho
4-1, Mizuhara, Itami-shi, Hyogo, Japan

(72) Inventor: Shigeru Harada
Mitsubishi Electric Corporation
Itami Seisakusho
4-1, Mizuhara, Itami-shi, Hyogo, Japan

(72) Inventor: Masanori Obata
Mitsubishi Electric Corporation
Itami Seisakusho
4-1, Mizuhara, Itami-shi, Hyogo, Japan

---

(71) Applicant: Mitsubishi Electric Corporation
2-2-3, Marunouchi, Chiyoda-ku, Tokyo, Japan
(74) Agent: Masuo Oiwa, Patent Attorney, and two others

SPECIFICATION

1. Title of the Invention

APPARATUS FOR PRODUCING SEMICONDUCTOR UTILIZING PLASMA REACTION

2. What Is Claimed Is:

[Claim 1]

An plasma reaction apparatus for producing semiconductors having an RF oscillating [electrode (inserted by the translator)] substrate that generates plasma reaction, wherein to said RF oscillating electrode substrate, provided are an insulating coating having great adherence to cover said RF oscillating electrode substrate, and a coating having low porosity to cover said insulating coating.

[Claim 2]

The plasma reaction apparatus for producing semiconductors of Claim 1, wherein said coating has a double-layer structure comprising a conductive coating and an insulating coating.

3. Detailed Explanation of the Invention

[Industrial Fields of Application]

The present invention relates to an apparatus for producing semiconductors that conducts CVD, etching, etc. by using an RF oscillating substrate that generates plasma reaction.

[Prior Art]

An example of the conventional RF oscillating electrode substrate is shown in Figure 2. This figure illustrates the RF oscillating electrode substrate after

the CVD film formation; Figure (a) is a sectional view, and Figure (b) is a front view of the RF oscillating electrode substrate.

In Figure 2, 1 denotes the RF oscillating electrode substrate made of carbon or the like, 2 denotes the film formed by CVD, 3 denotes the part where no CVD film is formed because a semiconductor substrate is placed during CVD film formation thereon, and 4 denotes the high-frequency (RF) oscillation source.

In the CVD method utilizing plasma reaction, this RF oscillating electrode substrate 1 is used not only as an electrode substrate for RF oscillation to etch CVD films, but also as a substrate to form CVD films. For example, during CVD film formation, while gas for the CVD film formation is being flowed, RF is oscillated, the back of a wafer being in close contact onto the RF oscillating electrode substrate 1 to form a CVD film.

In such constitution, after the wafer is removed, when the CVD film is etched on the RF oscillating electrode substrate 1, only the part 3 where no CVD film is formed on the surface of the substrate is directly attacked by the etching gas, so that the surface of the RF oscillating electrode substrate 1 become impoverished.

[original patent document: page (2)]

Regarding this problem, the application of the insulating coating 5 to the surface of the RF oscillating electrode substrate 1, as shown in Figure 3, appears to be a feasible solution. However, even by this attempt, arise such problems that the adherence between the RF oscillating electrode substrate 1, which is made of carbon, and the insulating coating 5 is poor, and also the etching gas readily reacts with the insulating coating 5, which in turn generates reaction products between the coating and the RF oscillating electrode substrate 1, resulting in the delamination of the insulating coating 5.

[Problems to Be Solved by the Invention]

Thus, when etching is performed on CVD films by the foregoing conventional apparatus, disadvantageously the RF oscillating electrode substrate is impoverished, dust is generated, and durability of the substrate is decreased by the etching gas. Even when a coating is provided, if it has a single layer, still the unfavorable delamination of the coating occurs.

The present invention was made in order to solve the problems mentioned above. The purpose of the present invention is to make an apparatus for producing semiconductors utilizing plasma reaction, wherein the RF oscillating electrode substrate can be prevented from being impoverished, dust generation can be suppressed, and the durability of the substrate can be improved.

[Means for Solving the Problems]

The present invention provides an RF oscillating electrode substrate, wherein said RF oscillating electrode substrate is coated by an insulating coating having great adherence, and said insulating coating is coated by a coating having low porosity.

[Operation of the Invention]

In accordance with the present invention, the delamination of the coating from the RF oscillating electrode substrate is prevented by using the insulating coating having great adherence, and the intrusion of etching gas is prevented by using the coating having low porosity.

[Example]

An example of the present invention is explained by referring to the drawing.

Figure 1 is a side sectional view of an example of the present invention; 1 denotes the RF oscillating electrode substrate, and 6 denotes the insulating coating having great adherence formed on the RF oscillating electrode substrate 1. To make said insulating coating 6, for example, [illegible] made of ceramic is melted in oxygen-acetylene flame at 2,000 to 4,000℃, which then is accelerated and sprayed by the use of an air jet, so that the surface of the RF oscillating electrode substrate 1 is coated. The sprayed melted ceramic is cooled on the RF oscillating electrode substrate 1, and adheres to the substrate while shrinking. Numeral 7 denotes the conductive coating made of N[illegible] or the like having a great resistance against etching gas that coats the insulating coating 6, and 8 denotes the insulating coating made of Al_2O_3 or the like having very low porosity that is formed on the conductive coating 7. To make the conductive coating 7 or the insulating coating 8, for example, first, gas such as N_2, H_2, and inert gas is ionized to generate a high-temperature, high-speed plasma jet, into which powder made of a conductive or insulating material for coating is sent. Thus, the powder is melted in the jet, and is accelerated and then shot to the RF oscillating electrode substrate 1 to form the coating. Particles stay in the plasma jet for 0.3 to 0.6 seconds, during which the particles melt and accelerate at 100 to 300 m/sec to collide to the substrate. Upon collision, the particles flatten and rapidly cool to solidify. The collided particles stack one after another to form the coating.

Furthermore, the conductive coating 7 is used as the middle layer, because it is difficult to completely prevent the intrusion of etching gas only by using the insulating coating 8.

Moreover, the RF oscillating electrode substrate 1 is used as a principal component to explain this example, but the present invention can be applied to any components that are attacked by etching gas or plasma in an apparatus for producing semiconductors utilizing plasma etching, so that such apparatus become more durable.

In this example, as has been explained, by using the insulating coating 6, the

PCL XL error

Subsystem: KERNEL

Error: IllegalTag

Operator: 0x1b

Position: 3039

Morningside | Translations

TRANSLATOR CERTIFICATION

I, Megumi Nozawa, a translator fluent in the Japanese language, on behalf of Morningside Evaluations and Consulting, do solemnly and sincerely declare that the following is, to the best of my knowledge and belief, a true and correct translation of the document(s) listed below in a form that best reflects the intention and meaning of the original text.

MORNINGSIDE EVALUATIONS AND CONSULTING

Signature of Translator

Date: November 5, 2005

Description of Documents Translated:

T15800:
3 Japanese Patent Applications, from Japanese to English:
***Kokai* No. H4-238882, *Kokai* No. S64-39728, and *Kokai* No. H3-115535**

450 7th Ave | 6th Floor | New York, NY 10123 | Tel 212.643.8800 | Fax 212.643.0005 | www.msida.com